APPARATUS AND METHOD FOR NAVIGATING VEHICLE TO DESTINATION USING DISPLAY UNIT

BACKGROUND OF THE INVENTION

1. Field of The Invention

The present invention relates to an apparatus and method for navigating a vehicle to a destination to which a vehicle occupant desires to reach using a display unit.

2. Description of Background Art

Various types of vehicular navigating systems (also called, vehicular route guidance apparatuses) in which an optimum route of travel from a start point of the vehicle to a destination is searched and derived and both of the optimum route and a present position of the vehicle are displayed on a display screen of a display unit have been proposed.

FIG. 1A exemplifies a displayed image in a case of one of the previously proposed vehicular navigating systems.

As shown in FIG. 1A, the present position of the vehicle is superimposed and displayed on the display image screen with an arrow mark and with its surrounding portion of the arrow marked present position encircled by a dotted line. Then, when an operator operates a predetermined switch, a range encircled with the dotted line is displayed in an extended form as shown in FIG. 1B. This permits the operator to recognize a road (traffic) situation surrounding the present position in details. In this way, when the displayed images are exchanged from FIG. 1A to FIG. 1B and vice versa, it is always necessary to operate the predetermined switch. This makes the operation troublesome.

On the other hand, another previously proposed navigating system in which road maps having different reduction of scales are simultaneously displayed on the display image screen, this display form being, so-called, superimposed displayed patterns, as shown in FIG. 2.

FIG. 2 exemplifies the displayed image screen of the other previously proposed vehicular navigating system, with intersection situations surrounding the present position of the vehicle being displayed in the extended scale form on a right upper corner of the displayed image screen. This other previously proposed navigating system permits the vehicular occupant to recognize the road map having a wide range of view with the present position of the vehicle as a center and to recognize the road (traffic) situation surrounding the present position of the vehicle in details.

However, since, in the displayed image screen shown in FIG. 2, the part of the road map has been displayed on the right upper corner of the displayed image screen in the extended scale form, the actual road map to be displayed on the right upper corner of the displayed image screen cannot be viewed from the displayed image screen (is hidden by the extended part of the road map). Hence, in a case where, for example, the vehicle driver tries to turn a right corner corresponding to the displayed portion of the hidden part (not displayed), the vehicle driver cannot recognize a road (traffic) situation in the forward direction. This makes the vehicle driver inconvenient.

SUMMARY OF THE INVENTION

It is, therefore, a principal object of the present invention to provide an apparatus and method for navigating a vehicle with a display unit which can solve the above-described problems by coordinate system transforming a road map image data into a desired bird's eye view so that the switch to change a reduction scale percentage of the road map as shown in FIGS. 1A and 1B is not needed and no such a limitation of the displayed range as shown in FIG. 2 occurs.

According to one aspect of the present invention there is provided an apparatus for navigating a vehicle using a display unit, comprising: a) road map storing means for storing a road map data related to a road map; b) vehicle position detecting means for detecting a present position of the vehicle; c) vehicle destination setting means through which a destination to which the vehicle is desired to reach is set on the road map; d) start point setting means for setting a start point of location on the road map at which the vehicle is to start on the basis of the detected present position of the vehicle; e) route of travel setting means for setting a route of travel on the road map from the start point to the set destination; and f) display control means for controlling an image of the road map surrounding the set route of travel to be displayed on a display image screen of the display unit, the image of the road map surrounding the set route of travel to be displayed on the display unit being taken in a form of a desired bird's eye view achieved when the bird's eye as a viewing point is placed at a predetermined position on an upper sky located in a direction opposite to the set destination with the present position of the vehicle as a reference and the road map surrounding the set route of travel being looked down over from the bird's eye.

According to another aspect of the present invention there is provided a method for navigating a vehicle using a display unit, comprising the steps of: a) storing a road map data related to a road map in a predetermined storing means; b) detecting a present position of the vehicle; c) setting a destination to which the vehicle is desired to reach is set on the road map; d) setting a start point of location on the road map at which the vehicle is to start on the basis of the detected present position of the vehicle; e) setting a route of travel on the road map from the start point to the set destination; and f) displaying on a display image screen of the display unit the image of the road map surrounding the set route of travel; and g) operatively transforming a coordinate system of the road map surrounding the set route of travel into a desired bird's eye view achieved when the bird's eye as a viewing point is placed on an upper sky located in a direction opposite to the set destination with the present position of the vehicle as a reference and the road map surrounding the set route of travel being looked down over from the bird's eye.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1A and 1B are explanatory views of examples of road map on a display image screen of a display unit in a former previously proposed navigation system described in the BACKGROUND OF THE INVENTION.

FIG. 2 is an explanatory view of another example of road maps simultaneously displayed on the display image screen of the display unit in a latter previously proposed navigation system described in the BACKGROUND OF THE INVENTION.

FIG. 3A is a schematic explanatory view of a bird's eye view prepared from a viewing point for explaining the bird's eye view applicable to an apparatus and method for navigating a vehicle using a display unit according to the present invention.

FIG. 3B is a schematic explanatory view of a bird's eye view in a three-dimensional coordinate system with a viewing point on a Z axis.

FIG. 4 is an explanatory view of an example of a displayed image screen in which the present position of the